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EXAMINER	
LEUNG, CHRISTINA Y	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/630,189	Applicant(s) YAP ET AL.	
	Examiner Christina Y. Leung	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 16 April 2007.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-5,7,9-11,14-16 and 19-26 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 7,15,19,21,22 and 24-26 is/are allowed.

6)☒ Claim(s) 1-5,11,14,16,20 and 23 is/are rejected.

7)☒ Claim(s) 9 and 10 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 4-13-07.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1, 2, 14, 16, and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over **DeLoach, Jr. et al.** (US 4,755,016 A) in view of **Carter et al.** (US 4,862,467 A).

Regarding **claims 1 and 23**, DeLoach, Jr. et al. disclose an optical frequency modulated transmitter (Figures 1 and 2) comprising:

(a) a plurality of slave lasers (i.e., elements labeled "high power laser" in Figures 1 and 2), each of the slave lasers having an output, the outputs of the plurality of slave lasers being combined (using coupler 25) to form a single output beam of the optical frequency modulated transmitter (column 2, lines 41-55); and

(b) a master optical oscillator (i.e., element labeled "single freq laser") which outputs an optical signal for injection locking of the plurality of slave lasers, the optical signal outputted by the master oscillator being frequency modulated directly in the master optical oscillator or externally thereof (using the modulator element labeled "mod" in the figures; DeLoach, Jr. et al. disclose that the transmitter system may be advantageously used with frequency modulated signals; see column 1, lines 14-22);

wherein the lasers of the plurality of slave lasers are injection locked to the master optical oscillator and are separately phased-controlled thereby adjusting the phase of each slave laser

relative to other slave lasers in the plurality of slave lasers (using phase delay elements labeled "ϕ" in Figures 1 and 2; column 2, lines 66-68; column 3, lines 1-9).

DeLoach, Jr. et al. disclose adjusting the relative phases of the slave lasers, but they do not specifically disclose applying a bias current or voltage to each slaver laser for adjusting frequency detuning of the slave laser with respect to the master optical oscillator.

However, Carter et al. teach a system that is related to the one disclosed by DeLoach, Jr. et al., including a plurality of slave lasers 22, 24, and 26 locked to a master oscillator 10 (Figure 1; column 2, lines 24-43). They further teach applying a bias current or voltage to each slave laser (via control lines 42 as shown in Figure 1) for adjusting frequency detuning of the slave laser with respect to the master optical oscillator thereby adjusting the phase of each slave laser relative to other slave lasers in the plurality of slave lasers (column 2, lines 58-66; column 3, lines 27-35).

Regarding claim 23 in particular, Carter et al. further teach that adjusting the phase of one slave laser relative to other slave lasers in the plurality of slave lasers causes the single output beam of the optical frequency modulated transmitter to be steered (column 2, lines 3-14).

Regarding claims 1 and 23, it would have been obvious to a person of ordinary skill in the art to apply current to each slave laser as taught by Carter et al. in the system disclosed by DeLoach, Jr. et al. as an engineering design choice of a way to effectively adjust the relative phase of the slave lasers and thereby properly synthesize and steer a particular desired output wavefront of the transmitted light signal (Carter et al., column 1, lines 58-68; column 2, lines 1-14). Examiner respectfully notes that Applicant's own specification discloses that various techniques may be utilized to control the relative phases of the slave lasers, including controlling

optical path lengths as already disclosed by DeLoach, Jr. (page 10, lines 23-30; page 11, lines 1-6).

Regarding **claim 2**, DeLoach, Jr. et al. disclose that the optical signal outputted by the master oscillator is modulated in an external modulator (i.e., the external modulator element labeled "mod" in the figures).

Regarding claims **14 and 16**, as similarly discussed above with regard to claim 1, DeLoach, Jr. et al. disclose a method of frequency modulating an optical beam (Figures 1 and 2) comprising the steps of:

providing a plurality of slave lasers (i.e. elements labeled "high power laser" in Figures 1 and 2), each of the slave lasers having an output, the outputs of the plurality of slave lasers being combined (using coupler 25) to form the optical beam (column 2, lines 41-55),

injection locking the plurality of slave lasers to an optical output of a master oscillator (i.e., element labeled "single freq laser"; column 2, lines 41-55);

frequency modulating the optical output of the master oscillator before the optical output thereof is applied to the plurality of lasers (using the modulator element labeled "mod" in the figures; DeLoach, Jr. et al. disclose that the transmitter system may be advantageously used with frequency modulated signals; see column 1, lines 14-22); and

individually phase controlling the slave lasers of the plurality of slave lasers to thereby adjust the phase of each slave laser relative to other slave lasers in the plurality of slave lasers (using phase delay elements labeled "ϕ" in Figures 1 and 2; column 2, lines 66-68; column 3, lines 1-9).

DeLoach, Jr. et al. disclose adjusting the relative phases of the slave lasers, but they do not specifically disclose applying a bias current or voltage to each slaver laser for adjusting frequency detuning of the slave laser with respect to the master optical oscillator.

However, again, Carter et al. teach a system that is related to the one disclosed by DeLoach, Jr. et al., including a plurality of slave lasers 22, 24, and 26 locked to a master oscillator 10 (Figure 1; column 2, lines 24-43). They further teach applying a bias current or voltage to each slave laser (via control lines 42 as shown in Figure 1) for adjusting frequency detuning of the slave laser with respect to the master optical oscillator thereby adjusting the phase of each slave laser relative to other slave lasers in the plurality of slave lasers (column 2, lines 58-66; column 3, lines 27-35).

Regarding claim 16 in particular, Carter et al. further teach that the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed in order to achieve wavefront coherence of the optical beam (column 3, lines 3-35).

Regarding claims 14 and 16, it would have been obvious to a person of ordinary skill in the art to apply current to each slave laser as taught by Carter et al. in the system disclosed by DeLoach, Jr. et al. as an engineering design choice of a way to effectively adjust the relative phase of the slave lasers and thereby properly synthesize and steer a particular desired output wavefront of the transmitted light signal (Carter et al., column 1, lines 58-68; column 2, lines 1-14). Examiner respectfully notes that Applicant's own specification discloses that various techniques may be utilized to control the relative phases of the slave lasers, including controlling optical path lengths as already disclosed by DeLoach, Jr. (page 10, lines 23-30; page 11, lines 1-6).

3. **Claims 3-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over **DeLoach, Jr. et al.** in view of **Carter et al.** as applied to claim 1 above, and further in view of **Herczeld et al.** ("Multiple Oscillator Lock Via Optical Link," Proceedings of the European Microwave Conference, Paris, 13 September 1985, pp. 578-583).

Regarding **claim 3**, DeLoach, Jr. et al. in view of Carter et al. describe a system and method as discussed above with regard to claim 1, including a modulated master oscillator but they do not specifically suggest that the master oscillator is modulated in response to an application of a modulation current or voltage thereto to thereby modulate the outputted optical signal.

However, various ways of modulating a laser are well known in the optical communications art including direct and external modulation techniques. Herczeld et al. in particular teach a system that is related to the one described by DeLoach, Jr. et al. in view of Carter et al. including slave lasers injection locked to a master oscillator (page 579, paragraph 1) and further teach modulating the master oscillator in response to an application of a modulation current or voltage thereto to thereby modulate the outputted optical signal (page 580, paragraph 2).

It would have been obvious to a person of ordinary skill in the art use direct modulation as suggested by Herczeld et al. in the system described by DeLoach, Jr. et al. in view of Carter et al. as an engineering design choice of a way to provide the already-disclosed modulation. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of

ordinary skill in the art. Examiner notes that Applicant's own specification discloses that direct or external modulation may be selected as a matter of deign choice (page 13, lines 19-21).

Regarding **claim 4**, DeLoach, Jr. et al. disclose at least one optical isolator (i.e., isolators 24 as shown in Figure 1) disposed between the master oscillator and the plurality of slave lasers to prevent unwanted injection of laser light back into the master oscillator from the slave lasers (column 2, lines 58-62).

Regarding **claim 5**, DeLoach, Jr. et al. disclose that the master oscillator and the plurality of slave lasers are each optical devices which output light of a single carrier frequency (column 1, lines 59-62).

4. **Claims 11 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over **DeLoach, Jr. et al.** in view of **Carter et al.** as applied to claims 1 and 14 respectively above, and further in view of **Bordonalli et al.** ("High-Performance Phase Locking of Wide Linewidth Semiconductor Lasers by Combined Use of Optical Injection Locking and Optical Phase-Lock Loop," Journal of Lightwave Technology, Vol. 17, No. 2, 2 February 1999, pp. 328-342).

Regarding **claims 11 and 20**, DeLoach, Jr. et al. in view of Carter et al. describe a system and method as discussed above with regard to claims 1 and 14 respectively, including a plurality of slave lasers. They do not specifically suggest the slave lasers are each arranged in a phase locked loop.

However, Bordonalli et al. teach a system that is related to the one described by DeLoach, Jr. et al. in view of Carter et al. including slave lasers injection locked to a master oscillator and further teach using a phase locked loop (Abstract; see also page 336, Figure 13).

Regarding claims 11 and 20, it would have been obvious to a person of ordinary skill in the art to include a phase locked loop as taught by Bordonalli et al. in the system described by DeLoach, Jr. et al. in view of Carter et al. in order to advantageously further reduce phase variance errors between the master oscillator and the slave lasers (Bordonalli et al., page 341, column 2, paragraph 2).

Allowable Subject Matter

5. **Claims 7, 15, 19, 21, 22, 24-26** are allowed.

6. **Claims 9 and 10** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for the indication of allowable subject matter were presented in the previous Office action.

Response to Arguments

7. Applicant's arguments filed 16 April 2007 with respect to claims 1-5, 11, 14, 16, 20, and 23 have been considered but are moot in view of the new ground(s) of rejection.

Upon further consideration, the rejections of claims 9 and 10 have been withdrawn, in view of the present amendment and in view of their subject matter being directed to subject matter similarly recited in claims 19 and 21, which were already previously indicated allowable.

Examiner respectfully notes that contrary to Applicant's assertion on pages 11 and 12 of the response, claims 23 and 26 were in fact addressed (rejected) on page 6 of the previous Office action mailed 31 January 2007. In view of the present amendment, in the present Office action,

claim 23 has been again rejected (on new grounds as discussed in detail above), and claim 26 has been indicated allowable.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 7:30 to 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christina Leung
CHRISTINA LEUNG
PRIMARY EXAMINER